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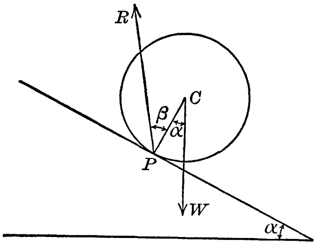
Hence,

$$I\frac{d^2s}{dt^2} = Ra^2 \sin\beta, \qquad \text{or} \qquad R\sin\beta = \frac{I}{a^2}\cdot\frac{d^2s}{dt^2} = \frac{5W}{8}.$$



Substituting in equation (1), we obtain

$$\left(W + \frac{5}{8}W\right)\frac{d^2s}{dt^2} = Wg\sin\alpha. \quad \therefore\ \frac{d^2s}{dt^2} = \frac{8}{13}g\sin\alpha.$$

That is, 5/13 of the acceleration of gravity is used in turning the cylinder.

II. SOLUTION BY J. H. KELLOGG, Oberlin College.

Let M, I, R and r be the mass, moment of inertia, and outer and inner radii of the cylinder respectively; $P.E.$ and $K.E.$ the changes in potential and kinetic energy, due to the descent; v the linear velocity, ω the angular velocity, and a the acceleration, of a point on the outer circumference; d the length of the plane; and g the acceleration due to gravity.

Remembering that the $K.E.$ has two parts, one translational and the other rotational; and that

$$R = 2r, \qquad v = r\omega, \qquad v^2 = 2ad, \qquad \text{and} \qquad I = M\frac{R^2 + r^2}{2};$$

then

$$K.E. = \tfrac{1}{2}Mv^2 + \tfrac{1}{2}I\omega^2 = \tfrac{1}{2}Mv^2\left[1 + \frac{R^2 + \left(\frac{R}{2}\right)^2}{2R^2}\right] = \frac{13}{16}Mv^2 = \frac{13}{8}Mda,$$

and

$$P.E. = Mg\,(d\sin\alpha).$$

But the energy of the system must remain the same; hence

$$P.E. = K.E.$$

and

$$a = \frac{8}{13}g\sin\alpha.$$

NUMBER THEORY.

224. Proposed by PATRICK WALSH, New Orleans, Louisiana.

Find the sides, in rational numbers, of a right angled triangle whose area is $5\frac{1}{2}$.

Solution by C. E. Horne, Westminster, Colorado.

Let $11x/y$ and y/x be the legs of the triangle, thus fulfilling one condition of the problem. Then

$$\frac{121x^2}{y^2}+\frac{y^2}{x^2}=\frac{121x^4+y^4}{x^2y^2}=\square.$$

This will be so when $121x^4+y^4=\square$. Let $\sqrt{121x^4+y^4}=11x^2+zy^2$. Then

$$x=y\sqrt{\frac{1-z^2}{22z}}$$

and

$$\frac{x}{y}=\sqrt{\frac{1-z^2}{22z}},$$

will be rational when

$$\sqrt{\frac{1-z^2}{22z}}=\square=\text{say } t^2.$$

Solving for z, we have $z=-11t^2\pm\sqrt{121t^4+1}$. When $t=3/70$ $z=-50/49$ or $49/50$. Hence, $x/y=3/70$; $11x/y=33/70$ and $y/x=70/3$. The hypotenuse $=4901/210$.

Note.—Having found one value of t which makes $\sqrt{121t^4+1}$, rational, we may find other values by making use of Euler's method, in his *Elements of Algebra*, third edition, revised by Hewlett, Chapter IX, p. 374.—Editor.

225. Proposed by W. DE W. CAIRNS, Oberlin College.

L'Intermédiaire for June, 1914, contains the following problem: "If we write the terms of the arithmetic series 1, 5, 9, 13, 17, 21, 25, 29, 33, $\cdots$ as follows:

$$\begin{array}{ccccccc}
1 \\
5 & 9 & 13 \\
17 & 21 & 25 & 29 & 33 \\
37 & 41 & 45 & 49 & 53 & 57 & 61 \\
\cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot\ ,
\end{array}$$

it is seen that the sum of the terms of each line is a cube, and that these are the cubes of the successive odd integers. How is this shown?"

It is here proposed not only to prove this, but to generalize the theorem as suggested, using, however, the simpler (and better known) case which includes all of the successive integers:

$$\begin{array}{cccc}
1 \\
3 & 5 \\
7 & 9 & 11 \\
13 & 15 & 17 & 19 \\
\cdot & \cdot & \cdot & \cdot\ .
\end{array}$$

Solution by Thos. E. Mason, Purdue University.

Theorem. Form the arithmetic series $1+2kn$, $n=0, 1, 2, 3, \cdots$, where k is any positive integer which remains constant for a given series. Arrange this